

WEST

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L6: Entry 1 of 2

File: JPAB

May 24, 1994

PUB-NO: JP406143935A

DOCUMENT-IDENTIFIER: JP 06143935 A

TITLE: PNEUMATIC TIRE

PUBN-DATE: May 24, 1994

INVENTOR-INFORMATION:

NAME

SHINOHARA, KAZUAKI

ASSIGNEE-INFORMATION:

NAME

BRIDGESTONE CORP

COUNTRY

N/A

APPL-NO: JP04298928

APPL-DATE: November 9, 1992

US-CL-CURRENT: 152/209.12

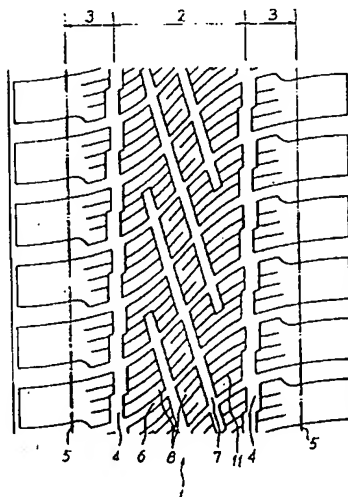
INT-CL (IPC): B60C 11/04; B60C 11/08; B60C 11/11

ABSTRACT:

PURPOSE: To provide a pneumatic tire used for both off-road (including dirt road) and on-road.

CONSTITUTION: This pneumatic tire is provided with a tread 1 having the tread width divided by the tread circumferences into three parts to provide the central region 2 and both side regions 3 between both edges and a pair of circumferential main grooves 4 near boundaries between these regions. Further, the pneumatic tire is provided with a plurality of S-shaped cross grooves 6 crossing the circumferential main grooves 4 and extending between both tread edges 5 at interval along the tread circumference and slant grooves 7 inclined in the opposite direction to the cross groove to cross a plurality of the cross grooves 6. The tread is formed with block-like land part 8 divided by these groove. The edges of the circumferential main grooves 4 have a gap therebetween narrower than those of the adjacent cross grooves 6 are arranged in a sea-through form staggered widthwise of the tread over the whole circumference of the tire, and both ends of the slant groove 7 are arranged to be stopped in the lands 8.

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L6: Entry 2 of 2

File: DWPI

May 24, 1994

DERWENT-ACC-NO: 1994-206025

DERWENT-WEEK: 199425

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TITLE: Pneumatic tyre for on and off road use - includes main grooves placed at quarter tread width positions from both tread side ends and S-shaped grooves crossing main grooves etc.

PATENT-ASSIGNEE:

ASSIGNEE

CODE

BRIDGESTONE CORP

BRID

PRIORITY-DATA:

1992JP-0298928

November 9, 1992

PATENT-FAMILY:

PUB-NO

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LANGUAGE

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MAIN-IPC

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APPLICATION-DATA:

PUB-NO

APPL-DESCRIPTOR

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1992JP-0298928

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INT-CL (IPC): B60C 11/04; B60C 11/08; B60C 11/11

ABSTRACTED-PUB-NO: JP06143935A

BASIC-ABSTRACT:

Pneumatic tyre has circumferential main grooves which are placed at a quarter tread width positions from both tread side ends and S shaped grooves which cross the main grooves and reach to both tread ends and inclined grooves which are incline in opposite direction with the S-shaped grooves and cross the S-shaped grooves and the both ends reach to lands which are divided with the S-shaped grooves.

The tyre has circumferential main grooves which are placed at a quarter tread width positions from tread ends and S-shaped grooves and inclined grooves.

USE/ADVANTAGE - The tyre has excellent driving performance and can be driven on off-road and on-road.

CHOSEN-DRAWING: Dwg.0/4

TITLE-TERMS: PNEUMATIC TYRE ROAD MAIN GROOVE PLACE QUATER TREAD WIDTH POSITION
TREAD SIDE END SHAPE GROOVE CROSS MAIN GROOVE

DERWENT-CLASS: A95 Q11

CPI-CODES: A12-T01B;

ENHANCED-POLYMER-INDEXING:

Patent Abstracts of Japan

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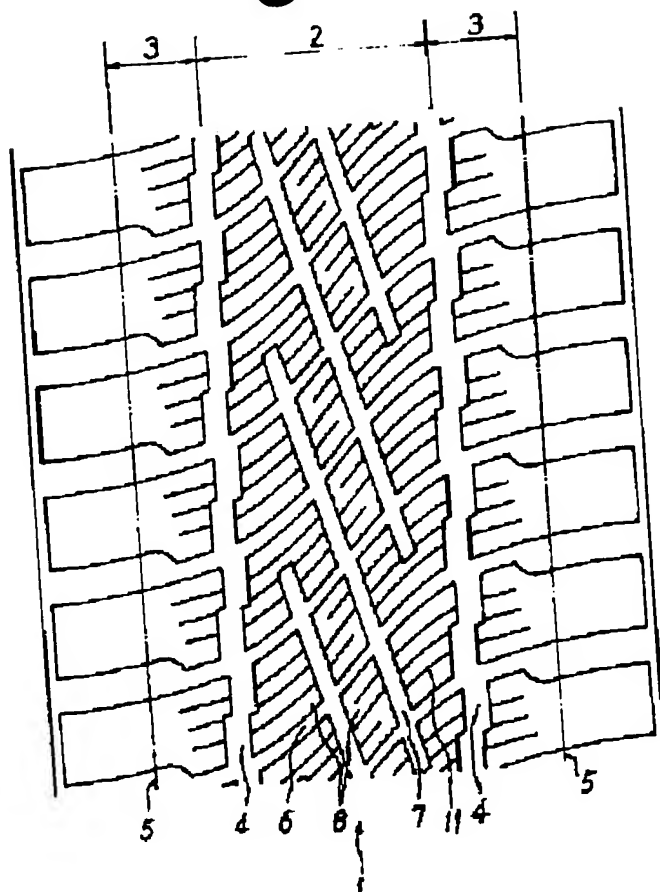
APPLICATION DATE : 09-11-92
APPLICATION NUMBER : 04298928

APPLICANT : BRIDGESTONE CORP;

INVENTOR : SHINOHARA KAZUAKI;

INT.CL. : B60C 11/04 B60C 11/08 B60C 11/11

TITLE : PNEUMATIC TIRE



ABSTRACT : PURPOSE: To provide a pneumatic tire used for both off-road (including dirt road) and on-road.

CONSTITUTION: This pneumatic tire is provided with a tread 1 having the tread width divided by the tread circumferences into three parts to provide the central region 2 and both side regions 3 between both edges and a pair of circumferential main grooves 4 near boundaries between these regions. Further, the pneumatic tire is provided with a plurality of S-shaped cross grooves 6 crossing the circumferential main grooves 4 and extending between both tread edges 5 at interval along the tread circumference and slant grooves 7 inclined in the opposite direction to the cross groove to cross a plurality of the cross grooves 6. The tread is formed with block-like land part 8 divided by these groove. The edges of the circumferential main grooves 4 have a gap therebetween narrower than those of the adjacent cross grooves 6 are arranged in a sea-through form staggered widthwise of the tread over the whole circumference of the tire, and both ends of the slant groove 7 are arranged to be stopped in the lands 8.

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審査請求 未請求 請求項の数4(全 5 頁)

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(22)出願日 平成4年(1992)11月9日

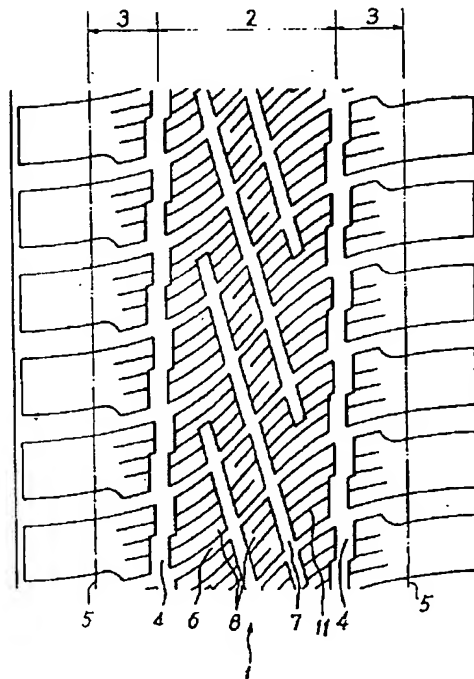
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(54)【発明の名称】 空気入りタイヤ

(57)【要約】

【目的】 本発明の目的は、オフロード（ダートロードを含む）およびオンロードの双方で使用できる空気入りタイヤを提供することにある。

【構成】 本発明の空気入りタイヤは、トレッド1をその両端からそれぞれトレッド幅を4等分するトレッド円周によって中央域2と両側方域3とに分けて、これらの境界付近に一对の円周主溝4を備え、さらにトレッド円周に沿う間隔においてこれら円周主溝4を横切り両トレッド端5間に延びるS字状の複数の横断溝6と、この横断溝6と逆向きに傾斜してそれらの複数本と交差する傾斜溝7とを備え、これらの溝で区分されるブロック状の陸部8を上記トレッドに形成し、互いに隣接する横断溝6の間隔よりも狭い間隔において円周主溝4の溝縁が、タイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になり、傾斜溝7の両端が陸部8に位置する端止め配列になることを特徴としている。



【特許請求の範囲】

【請求項1】トレッドをその両端からそれぞれトレッド幅を4等分するトレッド円周によって中央域と両側方域とに分けて、これらの境界付近に一对の円周主溝を備え、さらにトレッド円周に沿う間隔においてこれら円周主溝を横切り両トレッド端間に延びるS字状の複数の横断溝と、この横断溝と逆向きに傾斜してそれらの複数本と交差する傾斜溝とを備え、これらの溝で区分されるブロック状の陸部を上記トレッドに形成し、互いに隣接する横断溝の間隔よりも狭い間隔において円周主溝の溝縁が、タイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になり、傾斜溝の両端が、陸部に位置する端止め配列になることを特徴とする空気入りタイヤ。

【請求項2】横断溝が、円周主溝の溝縁に生ずべき段差で交差する請求項1に記載の空気入りタイヤ。

【請求項3】横断溝が、円周主溝間で傾斜溝により分断された不連続状の配列になる請求項1または2に記載の空気入りタイヤ。

【請求項4】各陸部が横断溝に沿う複数本のサイブを有する請求項1、2または3に記載の空気入りタイヤ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】原野、山岳、河原、砂漠などのオフロード（ダートロードを含む）における走行性能に優れるとともに、一般舗装道路等のオンロード、とりわけ濡れた路面での排水性と制動性、乾いた路面での高速安定性と騒音性に優れる空気入りタイヤに関し、特に総輪駆動（四輪駆動）の、乗用車およびライトトラックの使用に適合するトレッドパターンの改良を提案しようとするものである。

【0002】

【従来の技術】オフロード用タイヤは、舗装されていない走路における駆動・制動性能およびコーナリング性能等の操縦安定性を得るため、トレッドの陸部のエッジをできるだけ多くする。すなわち、エッジ効果を十分に発揮させるようなトレッドパターンを採用するのが一般的である。またこのオフロード用タイヤのトレッドパターンは、エッジ効果の発揮を主目的として形成されているので、氷雪路上で用いても有用である。

【0003】上記に示すタイヤとしては、トレッドに、直線状およびジグザグ状の複数の円周溝と、これら円周溝と交差する横溝と、これらの溝によって区分されたトレッドの陸部に複数のサイブとを備えたブロックパターンのタイヤがある（図3）。

【0004】

【発明が解決しようとする課題】四輪駆動の、乗用車およびライトトラックが高性能化していくにつれて、それらに用いられる空気入りタイヤに対しても、使用条件によってはオンロードとオフロードの両方で使用可能であ

るという万能性が要求されることもある。

【0005】しかし、これらの路面の走行に適したタイヤのトレッドパターンは、それぞれ相違する。すなわち、オンロードの走行では、高速走行での直進安定性や濡れた路面での耐ハイドロプレーニング性の点から、円周溝はトレッドの全周にわたってまっすぐ延びる形状が望ましく、横断溝は排水性の点からトレッド幅方向に連続的な形状であることが望ましい。一方、オフロードの走行では、上述したように円周溝および横溝をジグザグ形状にすることが望まれる。ゆえに、両者の適正溝形状は相反する関係にあり、このため現状のトレッドパターンを有する空気入りタイヤでは、オンロード・オフロードの両方の要求性能を満足させることができなかった。

【0006】そこで、本発明の課題は、オフロードにおける優れた走行性能とともに、オンロードにおける優れた性能、特に濡れた路面での排水性と制動性、乾いた路面での高速安定性と騒音性とを向上させたオンロード・オフロード両用の空気入りタイヤを提供することである。

【0007】

【課題を解決するための手段】本発明は、トレッドをその両端からそれぞれトレッド幅を4等分するトレッド円周によって中央域と両側方域とに分けて、これらの境界付近に一对の円周主溝を備え、さらにトレッド円周に沿う間隔においてこれら円周主溝を横切り両トレッド端間に延びるS字状の複数の横断溝と、この横断溝と逆向きに傾斜してそれらの複数本と交差する傾斜溝とを備え、これらの溝で区分されるブロック状の陸部を上記トレッドに形成し、互いに隣接する横断溝の間隔よりも狭い間隔において円周主溝の溝縁が、タイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になり、傾斜溝の両端が陸部に位置する端止め配列になることを特徴とする空気入りタイヤである。また、横断溝が、円周主溝の溝縁に生ずべき段差で交差すること、横断溝が、円周主溝間で傾斜溝により分断された不連続状の配列になること、各陸部が横断溝に沿う複数本のサイブを有すること、がより好ましい。

【0008】本発明による空気入りタイヤの一例を図1に示し、図中の1はトレッド、2は中央域、3は側方域、4は円周主溝、5はトレッド端、6は横断溝、7は傾斜溝、8はブロック状の陸部である。

【0009】本発明の空気入りタイヤは、トレッド1をその両端からそれぞれトレッド幅を4等分するトレッド円周によって中央域2と両側方域3とに分けて、これらの境界付近に一对の円周主溝4を備え、この円周主溝の溝縁がタイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になっている。このシースルー配列とは、トレッド円周に沿って円周主溝内を見通せることを意味する。

【0010】また本発明の空気入りタイヤは、トレッド

円周に沿う間隔においてこれら円周主溝4を横切り両トレッド端5間に延びるS字状の複数の横断溝6と、この横断溝と逆向きに傾斜してそれらの複数本と交差する傾斜溝7とを備え、これらの溝で区分されることによりブロック状の陸部8を形成して、傾斜溝7の両端が陸部8に位置する端止め配列になっている。

【0011】横断溝6は、その配設角度を、中央域2ではトレッド円周を含む平面に対し30°～50°、側方域3では該平面に対し70°～90°とするのが好ましい。中央域2における配設角度が30°未満だと、コーナリング性は向上するものの、特にダートロードでの駆動・制動性能が十分に得られなくなり、50°を超えるとその逆の現象が生じる。また、側方域3における配設角度を70°～90°としたのは、トレッド幅方向への排水性およびブロック剛性の確保とダートロードでの駆動・制動性能を維持するためであるとともに、左右コーナリング時の接地形状と横断溝形状が一致して騒音性を悪化させるのを防止するためである。

【0012】また、横断溝6は、円周主溝4の溝縁に生ずべき段差で交差することが、より長く連続した周方向のエッジ成分を確保するという点から好ましく、この横断溝6の配設形状を、排水性を重視する場合は、連続的なS字カーブにするのがよく、エッジ効果を重視する場合は、図2に示すような円周主溝4間で傾斜溝7により分断された不連続状にすることが好ましい。

【0013】傾斜溝7は、横断溝6と逆向きに傾斜してそれらの複数本と交差することにより、これら傾斜溝7と横断溝6の連結により中央域2に実質上周方向へ延びるジグザグ形状の溝を形成する。接地面圧が高く、タイヤの走行性能を大きく支配する中央域2に、このジグザグ形状の溝を配設することにより陸部8のエッジ成分が増加するため、ダートロードにおける操縦安定性がよくなる。このジグザグ形状の溝を中央域2により多く形成するために、傾斜溝7は、少なくとも4本以上の横断溝6と交差することが好ましく、傾斜溝7は、各横断溝6に対して、少なくとも二本が交差していることが好ましい。

【0014】またこの傾斜溝7の切り込み長さが、接地長さよりも周方向に長いことが好ましい。傾斜溝7の少なくとも一方の先端側が接地面から外れることにより高排水性が期待できる。傾斜溝の配設角度は、トレッドの円周を含む平面に対し5°～30°が好ましい。5°未満だと、排水性・騒音性は向上するが、駆動・制動性能は低下する。30°を超えるとその逆の傾向となる。したがって、両者の性能維持の均衡を図ると上記範囲の配設角度が好ましくなる。また、陸部エッジ成分の増加と、騒音の低減のために、図2のように傾斜溝7を屈折した直線上の連結溝としてもよい。

【0015】傾斜溝の両端をそれぞれ陸部に位置する端止め配列としたのは、陸部エッジ成分は増加させながら

ブロック剛性は維持するためであり、これによりダートロードでの高い操縦安定性が得られる。さらに、陸部エッジ成分の増加のため、陸部に横断溝に沿う複数本のサイブを有することが好ましい。

【0016】

【作用】本発明の空気入りタイヤは、そのトレッドに円周主溝4と、横断溝6と、この横断溝6と交差する傾斜溝7とを備え、これらを適正に配設することを特徴とするが、それらの作用については以下の通りである。

・円周主溝による作用

1. 円周主溝が、その溝内部をトレッド円周に沿って見通せる形状であるので高排水性が得られる。
2. トレッド円周に沿って溝を配設することにより、高速安定性が得られる。
3. コーナリング時に発生する横力に対する高いエッジ効果とともに、円周主溝の溝縁がタイヤ全周にわたってトレッド幅方向に交互にずれて千鳥状配列であるので、駆動・制動力に対するエッジ成分が増加するためのエッジ効果も得られる。

【0017】・横断溝による作用

横断溝の配設角度を、トレッド円周を含む平面に対し、中央域で小さくし、両側方域で大きくすることにより、中央域では駆動・制動力と横力の両方に対するエッジ効果が確保され、側方域では横方向への排水性と陸部剛性を維持することができるとともにコーナリング時の接地形状とこの溝形状が一致しないので騒音性にも優れる。

【0018】・傾斜溝による作用

1. 傾斜溝を、トレッド円周を含む平面に対し鋭角に傾斜させることにより、優れた排水性とコーナリング性が得られる。
2. 傾斜溝を複数の横断溝と交差させることにより、中央域に実質上周方向にジグザグ状の溝を形成するので、横力に対するコーナリング性と駆動・制動性が向上する。
3. 傾斜溝の両端を陸部に位置する端止め配列にすることにより、陸部剛性を低下させることなく陸部エッジ成分を増加させることができる。

【0019】

【実施例】タイヤサイズが31×10.50R15、トレッド幅が208mmである空気入りタイヤを供試タイヤとした。なお、トレッド以外の構造は、公知構造のものを使用した。

【0020】◎供試タイヤ

本発明タイヤの典型的なトレッドパターンの一例を図1および図2に、従来タイヤを図4に示す。

・実施例1

図1に示すトレッドパターンを有する発明タイヤは、互いに隣接する横断溝の間隔よりも狭い間隔において円周主溝の溝縁が、タイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になっている。こ

の円周主溝の溝幅は14mm、溝長さは円周主溝の溝縁の段差間で30mmで、この溝縁のずれは3.5mmである。S字カーブの横断溝は、配設角度が、トレッド円周を含む平面に対し、側方域で75°、中央域で40°とし、溝幅を側方域で10mm、中央域で5mmとした。傾斜溝は、配設角度が前記平面に対し、17°とし、溝幅を10mmとした。横断溝により区画される陸部には、それぞれこの横断溝に沿って3本のサイブを配設した。また、トレッド端5の近傍から外方にわたっては、排土・排雪性のために溝幅の広い拡大溝を設けている。

【0021】・実施例2

図2に示すトレッドパターンを有する発明タイヤは、互いに隣接する横断溝の間隔よりも狭い間隔を有する円周主溝の溝縁が、タイヤ全周にわたってトレッド幅方向に交互にずれた千鳥状のシースルー配列になっている。この円周主溝の溝幅は14mm、溝長さは円周主溝の溝縁の段差で30mmで、この溝縁のずれは3.5mmである。S字カーブの横断溝は、配設角度が、トレッド円周を含む平面に対し、側方域で75°、中央域で50°とし、溝幅を側方域で10mm、中央域では、その中央部で5mm、外側部で8mmとした。傾斜溝は、二個の屈折点を有する三本の直線状溝の結合からなり、五本の横断溝と交差し、かつ各横断溝に対しては二本が交差している。この傾斜溝は、前記平面に対し、各切り込み端を含む二本の直線状溝の配設角度が、その両側壁でそれぞれ12°と16°、溝幅が切り込み端側で12mm、その逆側で19mmとし、残り一本の直線状溝の配設角度が前記平面に対し、29°、溝幅を8.5mmとした。さらに、横断溝により区画される陸部には、それぞれこの横断溝に沿って3本のサイブを配設し、トレッド端5の近傍から外方にわたっては、排土・排雪性のために溝幅の広い拡大溝を設けている。

【0022】・従来例

図4に示すトレッドパターンを有する以外は実施例1に示す発明タイヤと同じ構造のタイヤである。

【0023】◎試験方法

試験は、JISに基づく正規タイヤ内圧および正規荷重（実車2名乗車相当）条件下で行った。試験は、ダート走行性、雪上性能、濡れた路面での排水性と制動性、乾燥路面での高速安定性と騒音性について行った。ダート走行性試験は、火山灰の地質に細かい砂利が散在する硬質ダートのテストコースを速度40～80km/hで走行したときのフィーリング評価であり、雪上性能は、冬季雪上路（積雪3mm）のテストコースを速度20～60km/hで走行したときのフィーリング評価であり、濡れた路面での排水性は、水深5mmの路面を走行したときのハイドロプレーニング現象が発生する限界速度により評価し、濡れた路面での制動性は、制動時の摩擦力を測定することにより評価し、高速安定性は、乾燥路面

のテストコースを速度60～120km/hで走行したときのフィーリング評価であり、騒音性は、テストパターンノイズ路を速度40～80km/hで走行したときのパターンノイズを測定して評価した。

【0024】◎試験結果

上記試験の結果を表1に示す。なお、表中の数値はいずれの試験も、従来例を100とした指数対比で表している、この値は大きいほど性能が優れている。

【0025】

【表1】

| | 従来例 | 実施例1 | 実施例2 |
|--------|-----|------------------|------|
| ダート走行性 | 100 | 97 | 99 |
| 雪上性能 | 100 | 98 | 99 |
| 排水性 | 100 | 105 _A | 103 |
| 制動性 | 100 | 102 | 103 |
| 高速安定性 | 100 | 105 | 103 |
| 騒音性 | 100 | 103 | 104 |

【0026】この試験結果から、本発明タイヤはダートロードや氷雪路面での性能を維持しつつ、濡れた路面での排水性と制動性能、乾いた路面での高速安定性と騒音性が優れているのがわかる。

【0027】

【発明の効果】本発明によれば、トレッドに円周主溝、横断溝、および傾斜溝を適正配置とすることにより、原野、山岳、河原、砂漠などのオフロードにおける優れた走行性能を有するばかりでなく、オンロードにおいても、濡れた路面では排水性と制動性、乾いた路面では高速安定性と騒音性に優れた性能を発揮することができる。したがって、オフロード・オンロードに両用できる空気入りタイヤを提供することができ、特に四輪駆動の、乗用車およびライトトラックに適用することができる。

【図面の簡単な説明】

【図1】実施例1に使用した代表的な発明タイヤであり、そのトレッド部を展開した主要部全面図である。

【図2】実施例2に使用した別の発明タイヤであり、そのトレッド部を展開した主要部全面図である。

【図3】ジグザグ状の円周主溝と横断溝とを配設した従来タイヤであり、そのトレッド部を展開した主要部全面図である。

【図4】従来例に使用したジグザグ状の円周主溝と横断溝とを配設した別の従来タイヤであり、そのトレッド部を展開した主要部全面図である。

【符号の説明】

1 トレッド

(5)

特開平6-143935

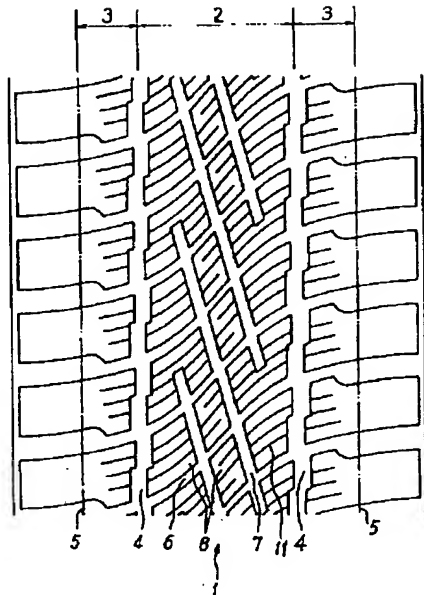
7

8

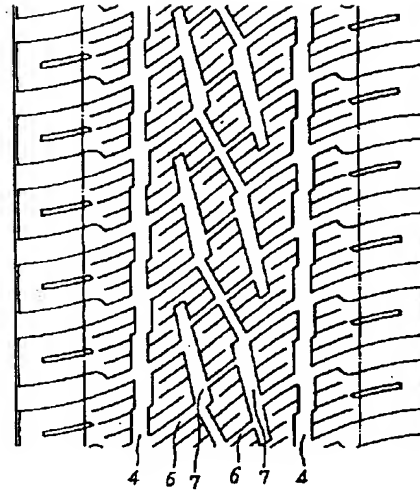
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- 3 側方域
- 4 円周主溝
- 5 トレッド端
- 6 横断溝

- 7 傾斜溝
- 8 陸部
- 9 円周溝
- 10 横溝
- 11 サイブ

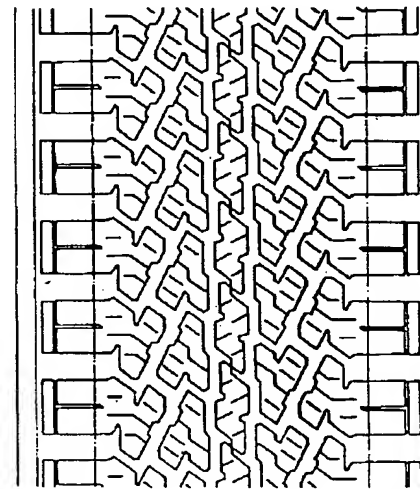
【図1】



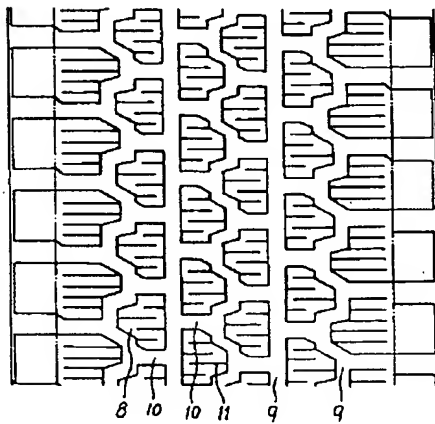
【図2】



【図4】



【図3】



English translation of relevant portion of JP-A-6-143935

Japanese Patent laid open No. 6-143935

Opened: May 24, 1994

Application No. 4-298928

Filed: November 9, 1992

Applicant: Bridgestone Corporation

Title of the Invention: Pneumatic tires

-- omitted --

[0001]

[Industrially Applicable Field] This invention relates to pneumatic tires having not only excellent running performances on off-the-road (inclusive of dirt road) such as wild plain, mountain, dry riverbed, desert and the like but also excellent performances on on-the-road such as general-purpose paved road and the like, particularly excellent drainage property and braking property on wet road surface and high-speed stability and noise reduction on dry road surface, and more particularly proposes an improvement of a tread pattern suitable for use in all wheel driven (four-wheel driven) passenger cars and light trucks.

[0002]

[Prior Art] In general, the off-the-road tires adopt such a tread pattern that the number of edges in land portions of the tread is made larger as far as possible for obtaining the steering stability such as traction and braking performances and cornering performance on non-paved road or the edge effect can sufficiently be developed. Further, the tread pattern of the off-the-road tire is formed as a main object for developing the edge effect and is useful even in the use on snow and ice roads.

[0003] As the above tire, there are tires having a block pattern in a tread defined by plural circumferential grooves extending straight or zigzag and plural lateral grooves crossing with the circumferential grooves and provided at its land portions with sipes (Fig. 3).

[0004]

[Problems to be solved by the invention] With the advance of high performances in the four-wheel driven passenger car and truck, the pneumatic tires used therefor may be required to have all-round property capable of using on

both on-the-road and off-the-road in accordance with use conditions.

[0005] However, the tread patterns of the tires suitably running on these road surfaces differ with each other. That is, during the running on on-the-road, the circumferential groove is desirable to be a shape of extending straight over a full circumference of the tread from a viewpoint of straight running stability at high-speed running and resistance to hydroplaning on wet road surface, and the lateral grooves are desirable to be a shape of continuously extending in the widthwise direction of the tread from a viewpoint of drainage property. On the other hand, during the running on off-the-road, the circumferential groove and lateral groove are desirable to be rendered into a zigzag shape as previously mentioned. Therefore, both the adequate groove shapes are a conflicting relation to each other. For this end, the pneumatic tires having the existing tread pattern can not satisfy the requirements on both on-the-road and off-the-road.

[0006] It is, therefore, an object of the invention to provide pneumatic tires for both on-the-road and off-the-road having improved running performances on not only off-the-road but also on-the-road, particularly having improved drainage property and braking property on wet road surface and high-speed stability and noise reduction on dry road surface.

[0007]

[Solution for the problems] The invention lies in a pneumatic tire, characterized in that a tread is divided into a central region and both side regions by tread circumferences dividing a tread width from both ends into four equal parts, and a pair of main circumferential grooves are arranged in the vicinity of a boundary between the central region and each side region, and a plurality of S-shaped lateral grooves crossing with the main circumferential grooves and extending between both ends of the tread and a plurality of slant grooves each extending slantly in a direction opposite to the lateral groove and crossing with some lateral grooves are arranged at intervals along the tread circumference, and block-shaped land portions defined by these grooves are formed in the tread, and the edges of the main circumferential groove are arranged at a gap narrower than a gap between mutually adjacent lateral grooves over the full circumference of the tire in a zigzag see-through form staggering them to each other in the widthwise direction of the tread, and both

ends of the slant groove are terminated in the land portions. Furthermore, it is favorable that the lateral groove is crossed with the main circumferential groove at a step difference to be produced in the edge thereof, and that the lateral groove is discontinuously arranged by cutting with the slant grooves between the main circumferential grooves, and that each of the land portions is provided with sipes extending along the lateral groove.

[0008] An embodiment of the pneumatic tire according to the invention is shown in Fig. 1, in which numeral 1 is a tread, numeral 2 a central region, numeral 3 a side region, numeral 4 a main circumferential groove, numeral 5 a tread end, numeral 6 a lateral groove, numeral 7 a slant groove, and numeral 8 a block-shaped land portion.

[0009] In the pneumatic tire according to the invention, the tread 1 is divided into the central region 2 and both side regions 3 by tread circumferences dividing a tread width from both ends thereof into four equal parts, and a pair of main circumferential grooves 4 are arranged in the vicinity of a boundary between the central region and each side region, and the edges of the main circumferential groove are arranged over a full circumference of the tire in a zigzag see-through form staggering them to each other in the widthwise direction of the tread. The term "see-through arrangement" used herein means that the main circumferential groove is visible along the tread circumference.

[0010] Furthermore, the pneumatic tire according to the invention is provided with a plurality of the S-shaped lateral grooves 6 arranged at intervals along the tread circumference and crossing with the main circumferential groove 4 and extending between both tread ends 5 and a plurality of the slant grooves 7 extending slantly in a direction opposite to the lateral groove and crossing with some lateral grooves, and the block-shaped land portions 8 are formed by defining with these grooves and also both the ends of the slant groove 7 are terminated in the land portions 8.

[0011] The lateral groove 6 is favorable to have an inclination angle of 30-50° with respect to a plane inclusive of the tread circumference at the central region 2 and 70-90° with respect to this plane at both side regions 3. When the inclination angle at the central region is less than 30°, the cornering performance is improved but the sufficient traction and braking performances on the dirt road are not obtained, while when it exceeds 50°, the

reverse phenomenon is caused. Further, the reason why the inclination angle at the side region 3 is restricted to 70-90° is due to the fact that the drainage property in the widthwise direction of the tread and the block rigidity are ensured and the traction and braking performances on the dirt road are maintained and further the ground contact shape in right or left cornering is not matched with the shape of the lateral groove to prevent the degradation of noise reduction.

[0012] Furthermore, it is preferable that the lateral groove 6 is crossed with the main circumferential groove 4 at a step difference to be produced in the edges thereof in view of ensuring longer and continuously circumferential edge component. The arranging shape of the lateral groove 6 is favorable to be continuous S-shaped curve in case of making great account of the drainage property, or to be discontinuous by cutting with the slant groove 7 between the main circumferential grooves 4 in case of making great account of the edge effect as shown in Fig. 2.

[0013] The slant groove 7 extends slantly in a direction opposite to the lateral groove 6 and is crossed with some lateral grooves, whereby a zigzag groove extending substantially in the circumferential direction is formed in the central region 2 through the connection of the slant groove 7 to the lateral groove 6. By arranging such a zigzag groove in the central region 2 being high in the ground contact pressure and largely controlling the running performances of the tire, the edge component of the land portion 8 is increased to improve the steering stability on the dirt road. In order to form a greater number of the zigzag grooves in the central region 2, it is favorable to cross the slant groove 7 with at least four lateral grooves, and that at least two slant grooves 7 are crossed with respect to each of the lateral grooves 6.

[0014] Further, it is favorable that the cutting length of the slant groove 7 is longer than the ground contact length in the circumferential direction because the high drainage property can be expected by coming off at least one end side of the slant groove 7 from the ground contact region. The inclination angle of the slant groove 7 is preferable to be 5-30° with respect to the plane inclusive of the tread circumference. When it is less than 5°, the drainage property and the noise reduction are improved, but the traction and braking performances lower, while when it exceeds 30°, the reverse tendency is caused. Therefore, the inclination angle of the above range becomes favorable in

order to balancedly maintain both the performances. Moreover, in order to increase the edge component of the land portion and reduce the noise, the slant groove 7 may be a bendedly straight connecting groove as shown in Fig. 2.

[0015] The reason why both ends of the slant groove are terminated in the land portions is due to the fact that the block rigidity is maintained while increasing the edge component of the land portion, whereby the high steering stability on the dirt road is obtained. Further, it is favorable that plural sipes are arranged in the land portion along the lateral groove for increasing the edge component of the land portion.

[0016]

[Function] The pneumatic tire according to the invention is characterized by properly arranging the main circumferential grooves 4, the lateral grooves 6 and the slant grooves 7 crossing with the lateral groove 6 in the tread. These grooves have functions as follows.

• Function through main circumferential groove

1. The main circumferential groove has a shape that the inside of the groove is visible along the tread circumference, so that the high drainage property is obtained.

2. The high-speed stability is obtained by arranging the groove along the tread circumference.

3. In addition to the high edge effect against lateral force produced in the cornering, an edge effect through the increase of edge component to traction and braking forces is obtained because the edges of the main circumferential groove are arranged over the full circumference of the tire in a zigzag form staggering them to each other in the widthwise direction of the tread.

[0017] •Function through lateral groove

The inclination angle of the lateral groove with respect to the plane inclusive of the tread circumference is made small in the central region and large in both side regions, whereby the edge effect to both the traction and braking forces and the lateral force is ensured in the central region and also the drainage property in the lateral direction and the rigidity of the land portion can be maintained in both side regions and the groove shape is not matched with the ground contact shape in the cornering and hence the noise reduction is excellent.

[0018] •Function through slant groove

1. The excellent drainage property and cornering performance are obtained by acutely inclining the slant

groove with respect to the plane inclusive of the tread circumference.

2. The zigzag groove extending substantially in the circumferential direction is formed in the central region by crossing the slant groove with plural lateral grooves, so that the cornering performance to the lateral force and the traction and braking performances are improved.

3. The edge component of the land portion can be increased without lowering the rigidity of the land portion by terminating both ends of the slant groove in the land portions.

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* NOTICES *

machine translation for Japan 6-143935

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] While excelling in the performance-traverse ability in off-road (a dirt load is included) one, such as a land, mountains, a dry river bed, and a desert, it is going to propose amelioration of the tread pattern which suits use of the passenger car and light truck of the total ring drive (four-wheel drive) especially about the pneumatic tire which is excellent in the wastewater nature in on load one and the road surface which divided and got wet, braking nature and the high-speed stability in the dry road surface, and noise nature, such as general pavement.

[0002]

[Description of the Prior Art] The tire for off-road one makes [many / as possible] the edge of the land section of a tread in order to obtain driving stability, such as drive / braking engine performance in the roadway which is not paved, and cornering nature. That is, it is common to adopt a tread pattern in which is made to fully demonstrate an edge effect and it deals. Moreover, since the tread pattern of this tire for off-road ones is formed as a key objective, even if exertion of an edge effect is used for it by the snow-and-ice on the street, it is useful.

[0003] There is a tire of the block pattern which equipped with two or more SAIPU the land section of the tread classified into the tread by two or more circumference slots of the shape of the shape of a straight line and zigzag, the transverse grooves which intersect these circumference slot, and these slots as a tire shown above (drawing 3).

[0004]

[Problem(s) to be Solved by the Invention] Depending on a service condition, the versatility that it is usable at off-road both may be required as on load also from the pneumatic tire used for them as the passenger car and light truck of a four-wheel drive high-performance-ize.

[0005] However, the tread pattern of a tire suitable for transit of these road surfaces is different, respectively. That is, to transit on load, it is desirable for the point of the rectilinear propagation stability in high-speed transit or the hydroplaning-proof nature in the wet road surface to a circumference slot to have desirable straight stretch ***** over the perimeter of a tread, and to be a configuration with a crossing slot continuous from the point of wastewater nature to the tread cross direction. On the other hand, to off-road transit, to make a circumference slot and a transverse groove into a zigzag configuration, as mentioned above is desired. Therefore, the shape of both proper quirk has an opposite relation, and the military requirement of on load and off-road both was not able to be satisfied to the pneumatic tire which has the present tread pattern for this reason.

[0006] Then, the technical problem of this invention is offering the pneumatic tire both for [which raised the wastewater nature in the outstanding engine performance which can be set on load with the outstanding performance-traverse ability in off-road one, and the road surface which got wet especially, braking nature and the high-speed stability in the dry road surface, and noise nature] on-load off-road one.

[0007]

[Means for Solving the Problem] This invention divides a tread into a central region and a method region of both sides from the both ends by the tread circumference which divides tread width of face into four equally, respectively. a gap which is equipped with a circumference major groove of a pair near [these] a boundary, and meets the tread circumference further -- with two or more crossing slots of the shape of S character which is, crosses these circumference major groove and is prolonged between both tread edges It has an inclination slot which inclines in this crossing slot and reverse sense, and intersects two or more [those]. The land section of a letter of a block classified in these slots is formed in the above-mentioned tread. It becomes the alternate see-through array from which a gap narrower than a gap of a crossing slot which adjoins mutually was set, and **** of a circumference major groove shifted crosswise [tread] by turns over the tire perimeter. It is the pneumatic tire characterized by both ends of an inclination slot becoming the edge stop array located in the land section. Moreover, it is more desirable than that a crossing slot's crossing with a level difference which should be produced in **** of a circumference major groove, and a crossing slot become the array of the shape of discontinuity divided by inclination slot between circumference major grooves, having two or more SAIPU to which each **** meets a crossing slot, and **.

[0008] an example of a pneumatic tire by this invention -- drawing 1 -- being shown -- one in drawing -- a tread and 2 -- for a circumference major groove and 5, as for a crossing slot and 7, a tread edge and 6 are [a central region and 3 / a side region and 4 / an inclination slot and 8] the land sections of a letter of a block.

[0009] A pneumatic tire of this invention divides a tread 1 into the central region 2 and the method region 3 of both sides from

those both ends by the tread circumference which divides tread width of face into four equally, respectively, is equipped with the circumference major groove 4 of a pair near [these] a boundary, and has become the alternate see-through array from which **** of this circumference major groove shifted crosswise [tread] by turns over the tire perimeter. This see-through array means that seeing the inside of a circumference major groove can be kept in accordance with the tread circumference.

[0010] moreover, a gap to which a pneumatic tire of this invention meets the tread circumference -- with two or more crossing slots 6 of the shape of S character which is, crosses these circumference major groove 4, and is prolonged between both the tread edges 5 It has the inclination slot 7 which inclines in this crossing slot and reverse sense, and intersects two or more [those], and the land section 8 of a letter of a block is formed by being classified in these slots, and both ends of the inclination slot 7 have become the edge stop array located in the land section 8.

[0011] As for the crossing slot 6, it is desirable to make the arrangement angle into 70-90 degrees to this plane in 30-50 degrees and the side region 3 to a plane which includes the tread circumference in the central region 2. If an arrangement angle in the central region 2 is less than 30 degrees, although cornering nature will improve, if drive / braking engine performance in a dirt load is fully obtained no longer and exceeds 50 degrees especially, a phenomenon of the reverse will arise. Moreover, an arrangement angle in the side region 3 was made into 70-90 degrees for preventing the shape of a touch-down configuration and a crossing quirk at the time of right-and-left cornering being in agreement, and worsening noise nature, while being for maintaining drive / braking engine performance in reservation and a dirt load of wastewater nature to the tread cross direction, and block rigidity.

[0012] Moreover, a thing to cross with a level difference which should be produced in **** of the circumference major groove 4 the crossing slot 6 When it is desirable from a point of securing an edge component of a hoop direction which continued for a long time and thinks wastewater nature as important for an arrangement configuration of this crossing slot 6 It is good to make it a continuous S character curve, and when thinking an edge effect as important, it is desirable to make it the shape of discontinuity divided by the inclination slot 7 between the circumference major grooves 4 as shown in drawing 2.

[0013] The inclination slot 7 forms a slot of a zigzag configuration prolonged to a parenchyma top hoop direction in the central region 2 by connection of these inclination slot 7 and the crossing slot 6 by inclining in the crossing slot 6 and reverse sense, and intersecting two or more [those]. Touch-down planar pressure is high, and since an edge component of the land section 8 increases by arranging a slot of this zigzag configuration in the central region 2 which governs performance-traverse ability of a tire greatly, driving stability in a dirt load becomes good. In order to form many slots of this zigzag configuration by the central region 2, as for the inclination slot 7, it is desirable to intersect at least four or more crossing slots 6, and it is [the inclination slot 7] desirable that at least two cross to each crossing slot 6.

[0014] Moreover, the slitting length of a ***** of this inclination slot 7 is more desirable than touch-down length to a hoop direction. When one [at least] tip side of the inclination slot 7 separates from a ground plane, high wastewater nature is expectable. An arrangement angle of an inclination slot has desirable 5-30 degrees to a plane including the circumference of a tread. Although wastewater nature and noise nature will improve if it is less than 5 degrees, drive / braking engine performance falls. If it exceeds 30 degrees, it will become the orientation of the reverse. Therefore, if balance of both engine-performance maintenance is aimed at, an arrangement angle of the above-mentioned range will become desirable. Moreover, it is good also as a connection slot on a straight line refracted in the inclination slot 7 like drawing 2 for an increment in a land section edge component, and reduction of noise.

[0015] While having considered both ends of an inclination slot as an edge stop array located in the land section, respectively increases a land section edge component, block rigidity is for maintaining and, thereby, high driving stability in a dirt load is obtained. Furthermore, it is desirable to have two or more SAIPU which meets a crossing slot at the land section because of an increment in a land section edge component.

[0016]

[Function] Although the pneumatic tire of this invention is characterized by equipping that tread with the circumference major groove 4, the crossing slot 6, and the inclination slot 7 that intersects this crossing slot 6, and arranging these proper, it is as operations / those] follows.

- Since the operation 1. circumference major groove by the circumference major groove is the configuration which can keep seeing the interior of a slot in accordance with the tread circumference, high wastewater nature is obtained.

2. High-speed stability is acquired by arranging a slot in accordance with the tread circumference.

3. An edge effect for the edge component to a drive and damping force to increase [**** of a circumference major groove shifts crosswise / tread / by turns over the tire perimeter, and] with the high edge effect over the lateral force generated at the time of cornering, since it is an alternate array is also acquired.

[0017] - the edge effect over both a drive and damping force, and lateral force be secure, and since the touch-down configuration and the shape of this quirk at the time of a cornering be in agreement while lateral wastewater nature and **** rigidity be maintainable, in a central region; excel also in noise nature in a side region by make small the arrangement angle of the operation crossing slot by the crossing slot, and enlarge it in the method region of both sides to a plane including the tread circumference in a central region.

[0018] - The outstanding wastewater nature and cornering nature are obtained by making the operation 1. inclination slot by the inclination slot incline acutely to a plane including the tread circumference.

2. Since a zigzag-like slot is formed in a central region by making an inclination slot intersect two or more crossing slots in a parenchyma top hoop direction, the cornering nature and drive / braking nature to lateral force improve.

3. A land section edge component can be made to increase by making the both ends of an inclination slot the edge stop array located in the land section, without reducing **** rigidity.

[0019]

[Example] The pneumatic tire whose tire size is 31x10.50R15 and whose tread width of face is 208mm was used as the sample offering tire. In addition, the thing of well-known structure was used for structures other than a tread.

[0020] O An example of the typical tread pattern of a sample offering tire this invention tire is shown in drawing 1 and drawing 2, and a tire is conventionally shown in drawing 4.

- The invention tire which has the tread pattern shown in example 1 drawing 1 is the alternate see-through array from which the gap narrower than the gap of the crossing slot which adjoins mutually was set, and **** of a circumference major groove shifted crosswise [tread] by turns over the tire perimeter. The flute width of this circumference major groove is 14mm, a flute length is 30mm between the level differences of **** of a circumference major groove, and a gap of this **** is 3.5mm. To the plane including the tread circumference, it was made as 75 degrees in the side region, and the arrangement angle made the crossing slot of a S character curve 40 degrees in the central region, it was set as 10mm in the side region, and it set the flute width to 5mm in the central region. The arrangement angle made the inclination slot 17 degrees to said plane, and it set the flute width to 10mm. Three SAIPU was arranged in the land section divided by the crossing slot along this crossing slot, respectively. Moreover, if the method of outside is covered near the tread edge 5, the large expansion slot on the flute width is prepared for earth removal and *****.

[0021] - The invention tire which has the tread pattern shown in example 2 drawing 2 is the alternate see-through array from which the gap narrower than the gap of the crossing slot which adjoins mutually was set, and **** of a circumference major groove shifted crosswise [tread] by turns over the tire perimeter. The flute width of this circumference major groove is 14mm, a flute length is 30mm in the level difference of **** of a circumference major groove, and a gap of this **** is 3.5mm. To the plane including the tread circumference, it was made as 75 degrees in the side region, and the arrangement angle made the crossing slot of a S character curve 50 degrees in the central region, in the side region, it was set as 5mm in the center section, and it set the flute width to 8mm by the lateral part in 10mm and a central region. An inclination slot consists of association of three straight line-like slots which have two inflection points, and five crossing slots are intersected, and two cross to each crossing slot. 12 degrees, 16 degrees, and a flute width set [the arrangement angle of two straight line-like slots including each slitting edge] this inclination slot to 19mm by slitting one end with that both-sides wall to said plane at the 12mm and reverse side of those, respectively, and the arrangement angle of remaining one straight line-like slot set 29 degrees and a flute width to 8.5mm to said plane. Furthermore, if three SAIPU is arranged along this crossing slot, respectively and the method of outside is covered near the tread edge 5, the large expansion slot on the flute width is established in the land section divided by the crossing slot for earth removal and *****.

[0022] - It is the tire of the same structure as the invention tire shown in an example 1 except having the tread pattern shown in conventional example drawing 4.

[0023] O The test-method trial was performed under the normal tire internal pressure and normal load (equivalent for real vehicle binary-name entrainment) conditions based on JIS. The trial followed dirt performance traverse, the engine performance on the snow, the wastewater nature in the wet road surface, braking nature and the high-speed stability in a desiccation road surface, and noise nature. A dirt performance-traverse trial is feeling evaluation when running the test course of hard dirt where fine ballast is scattered in the geology of volcanic ash by speed 40 - 80 km/h. The engine performance on the snow The wastewater nature in the road surface which is feeling evaluation when running the test course of a winter way (snow coverage of 3mm) on the snow by speed 20 - 60 km/h, and got wet The critical speed which hydroplaning when running a road surface with a depth of 5mm generates estimates, and the braking nature in the wet road surface It evaluates by measuring the frictional force at the time of braking. High-speed stability It is feeling evaluation when running the test course of a desiccation road surface by speed 60 - 120 km/h, and noise nature measured and evaluated the pattern noise when running a test pattern noise way by 40-80km/h in speed.

[0024] O The result of the test-result above-mentioned trial is shown in a table 1. In addition, the numeric value in a table is expressed with the characteristic contrast to which any trial set the conventional example to 100, and the engine performance is excellent, so that this value is large.

[0025]

[A table 1]

| | 従来例 | 実施例 1 | 実施例 2 |
|--------|-----|-------|-------|
| ダート走行性 | 100 | 97 | 99 |
| 雪上性能 | 100 | 98 | 99 |
| 排水性 | 100 | 105 | 103 |
| 制動性 | 100 | 102 | 103 |
| 高速安定性 | 100 | 105 | 103 |
| 騒音性 | 100 | 103 | 104 |

[0026] From this test result, it is understood that the wastewater nature, the braking engine performance and the high-speed stability in the dry road surface, and noise nature in the wet road surface are excellent, this invention tire maintaining the engine performance in a dirt load or a snow-and-ice road surface.

[0027]

[Effect of the Invention] It not only has the outstanding performance-traverse ability in off-road one, such as a land, mountains, a dry river bed, and a desert, by making a circumference major groove, a crossing slot, and an inclination slot into optimal location and allocation at a tread, but according to this invention, even if it sets on load, it can demonstrate the engine performance which was excellent in wastewater nature and braking nature on the wet road surface, and was excellent in the dry road surface at high-speed stability and noise nature. Therefore, off-road one and the pneumatic tire which can carry out two ways on load can be offered, and it can apply to the passenger car and light truck of a four-wheel drive especially.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] A tread is divided into a central region and a method region of both sides from the both ends by the tread circumference which divides tread width of face into four equally, respectively. a gap which is equipped with a circumference major groove of a pair near [these] a boundary, and meets the tread circumference further -- with two or more crossing slots of the shape of S character which is, crosses these circumference major groove and is prolonged between both tread edges It has an inclination slot which inclines in this crossing slot and reverse sense, and intersects two or more [those]. The land section of a letter of a block classified in these slots is formed in the above-mentioned tread. A pneumatic tire characterized by becoming the alternate see-through array from which a gap narrower than a gap of a crossing slot which adjoins mutually was set, and **** of a circumference major groove shifted crosswise [tread] by turns over the tire perimeter, and both ends of an inclination slot becoming the edge stop array located in the land section.

[Claim 2] A pneumatic tire according to claim 1 with which a crossing slot crosses with a level difference which should be produced in **** of a circumference major groove.

[Claim 3] A pneumatic tire according to claim 1 or 2 with which a crossing slot becomes the array of the shape of discontinuity divided by inclination slot between circumference major grooves.

[Claim 4] A pneumatic tire according to claim 1, 2, or 3 which has two or more SAIPU to which each land section meets a crossing slot.

[Translation done.]